

CLAIMS

1. A method of forming spot welds in a workpiece of aluminum alloy sheet metal, each said workpiece comprising two or more layers of said sheet metal with each layer having thickness of from about 0.9 mm to about 4 mm or more, said method comprising:

pressing two opposing copper or copper alloy electrodes on opposite sides of said layers of sheet metal to provide a contact force and electrical contact with said layers for said spot weld, said electrodes each having a round body with a diameter of at least 11 millimeters and terminating at one end in a round cone with a spherically crowned weld face surface, the diameter of said crowned weld face surface being in the range of 11 millimeters to the diameter of said body and the radius of said spherically crowned weld face surface being in the range of about 20 to 35 millimeters, and the surface of said crowned weld face surface having a texture; and

passing a welding current between said electrodes to produce a spot weld nugget between said workpieces.

2. A method as recited in claim 1 in which said electrodes each have a round body with a diameter in the range of about 11 to 19.5 millimeters.

3. A method as recited in claim 1 in which the diameter of said weld face is in the range of about 11.5 mm to about 19 mm.

4. A method as recited in claim 1 in which the diameter of said weld face is in the range of about 11.8 mm to about 11.9 mm.

5. A method as recited in claim 1 in which the radius of said spherically crowned weld face is in the range of about 20 mm to about 35 mm.

6. A method as recited in claim 1 in which the radius of curvature of said spherically crowned weld face is in the range of about 25 mm to about 26 mm.

7. A method as recited in claim 1 in which the texture of said weld face surface is characterized by a peak to valley roughness of about 5 to 30 micrometers.

8. A method of forming spot welds as recited in claim 1 comprising forming said spot welds in a succession of said work pieces in which the thicknesses of said layers vary from workpiece to workpiece using the same electrodes.

9. A method of forming spot welds as recited in claim 2 comprising forming said spot welds in a succession of said work pieces in which the thicknesses of said layers vary from workpiece to workpiece using the same electrodes.

10. A method of forming spot welds as recited in claim 3 comprising forming said spot welds in a succession of said work pieces in which the thicknesses of said layers vary from workpiece to workpiece using the same electrodes.

11. A method of forming spot welds as recited in claim 6 comprising forming said spot welds in a succession of said work pieces in

which the thicknesses of said layers vary from workpiece to workpiece using the same electrodes.

12. A method of forming spot welds as recited in claim 7 comprising forming said spot welds in a succession of said work pieces in which the thicknesses of said layers vary from workpiece to workpiece using the same electrodes.

13. A method of making successive spot welds on a group of workpieces where each workpiece comprises two or more layers of aluminum alloy sheet metal and each layer has a thickness in the range from about 0.9 millimeters to about 4 millimeters, said group of workpieces comprising at least one member having sheet metal layers that differ in thicknesses within said range from other members of said group, said method comprising:

(a) placing a first workpiece between a pair of axially opposing copper or copper alloy electrodes;

(b) pressing said electrodes against opposite sides of said workpiece at a spot welding location to apply a contact force and electrical contact with contacted layers for said spot weld;

(c) passing an electrical current through said electrodes and said workpiece at said location for a time sufficient to make said spot weld;

(d) opening said electrodes for relocation or removal of said workpiece; and

(e) repeating steps (a) through (d) with successive workpieces of said group, said electrodes each having a body terminating at one end in a truncated round cone with a spherically crowned weld face surface, the diameter of said crowned weld face surface being in the range of about 11.5 mm to about 12.5 millimeters and the radius of said spherically crowned

weld face surface being in the range of about 20 to about 35 millimeters, and the surface of said crowned weld face surface having a texture.

14. A method as recited in claim 13 in which the diameter of said weld face is in the range of about 11.8 mm to about 11.9 mm.

15. A method as recited in claim 13 in which the radius of said spherically crowned weld face is in the range of about 20 mm to about 35 mm.

16. A method as recited in claim 13 in which the radius of said spherically crowned weld face is in the range of about 25 mm to about 26 mm.

17. A method as recited in claim 13 in which said weld face surface is characterized by a peak to valley roughness of 5 to 30 micrometers.